ADEXA Predict, not just response

Predictive (Risk-Resilient) Planning

How do you plan in the face of uncertainty? Produce more than expected? If so, by how much? Re-plan when an undesired event occurs?

It might take too long and it may be too late! How do you even know if a Re-plan is needed? How do you assess the impact of the event on your supply chain? On your profitability and market share?

Traditional planning systems rely on a deterministic model of the supply chain. The approach has been the ability to simulate events using what-if planning and decide what precautions to take to mitigate risk.

In addition, so called response planning has been promoted as a way of dealing with unexpected events! Response planning, however, may be just too late.

Your choices are limited as to what can be done. If a large order comes in and you do not have enough of the right material or capacity, how would you respond? Similarly, how do you respond if a major bottleneck resource goes down for extended period.

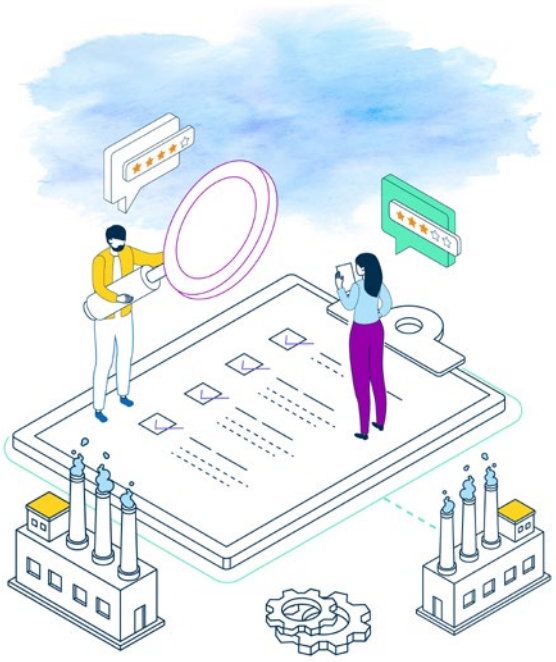
Your response planning will not be that useful! As for what-if scenario planning, it might seem to be more proactive than response planning, however there are too many variables to consider.

In reality, there are thousands of different scenarios that can be looked at but we are generally limited to a handful of them. But so many things can go wrong, even thousands of scenarios cannot help despite having the right computing power at your disposal and the time to examine each one of them!

A whole new paradigm is needed to address risk when it comes to supply chain planning. Let's examine why we plan first. *We plan for responsiveness and we execute for reliability.* The closer you are to execution of the plan the faster you can respond. Therefore, less planning is needed.

Imagine the function of shock absorbers in a car. Having made a plan to drive on a particular road, shock absorbers execute the plan by absorbing all the bumps and potholes on the road in order to make the ride as smooth as possible. As long as you are not too uncomfortable, you stay with the plan.

Once it gets too uncomfortable, meaning the shocks are incapable of handling the bumps, then you decide to take a different route. Note that Shock absorbers need very little planning and are reactive. The next level of execution is the driver, who uses gas pedal and brake as well as other controls in order to drive the car towards the destination.



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If a person or another car suddenly appears in front of the car, the driver slows down or stops. None of this was in the original plan. But it happens in execution; no planning is needed, and there is enough time for reaction. So, what happens if we cannot or fail to react, such as an accident or road block?

The next level is the GPS system or your own experience as to how to get from point A to B. Knowing the road conditions in real-time or having experienced the same route over time allows you to plan the route and the time to leave point A to get to point B on time.

Depending on the external events or internal issues (breakdown) responses can vary. Past experience or real-time information can be used in order to *estimate* how long it takes to get to the destination.

The more we travel the same route the better is our understanding of potential events and the time it takes. For example, experience tells us during snow season it take 45 minutes but other times it takes 20 minutes to go from A to B. The means we can learn from our past experiences.

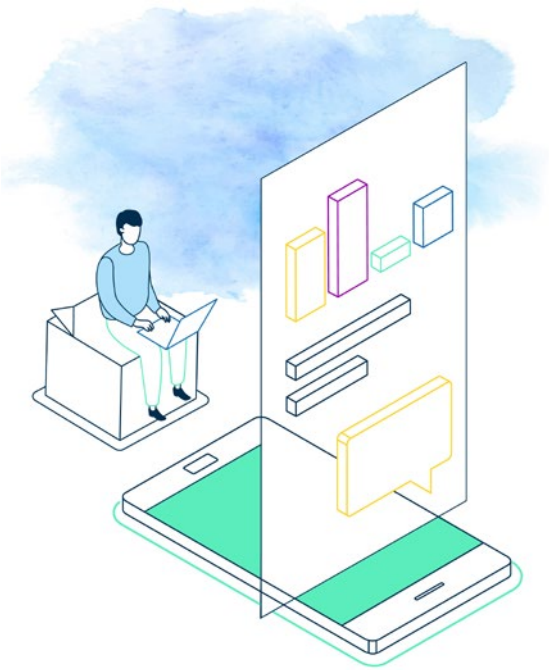
The system can also learn from past experiences. This allows us to perform *predictive planning, or risk-resilient planning.* The system can, through machine learning algorithms, estimate how long it takes to go from A to B by looking at many other variables some of which we may not even be aware of. Hence it would account for enough slack in the plan to ensure on-time delivery.

To conclude from the above analogy, there are multiple levels of planning that must be constantly communicating together holistically. At higher levels we plan with just the right amount of cushion in order to allow for execution.

The cushion (or *margin of risk resiliency*-MRR) depends on factors such as time of the year, weather or holiday gift seasons, size of the order etc. Thus, there is enough variability built into the system in order to perform reliable execution and deliver the results.

Hence for every order that comes in, depending on when and where, we can attach an MRR index. The higher the potential risk the higher is MRR and therefore the bigger expected variance.

Currently, we use the same measure of risk resiliency for execution by controlling cycle times and the amount of slack given to each order. This Continuity Index (CI) is the basis of risk control for planning and executing each order. Same concept applies to the amount of inventory kept.



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By identifying the risk of running out learned over time one can decide the variability and the amount needed to be kept depending on the season, fashion or any other event.

Finally, what happens in case of high impact and infrequent bigger events such as a 5-hour road blockage while we are driving to the airport? As described earlier, the higher the impact of the event the higher should be the level of decision making (intelligence).

Much like the architecture that we described above a shock absorber can signal to the driver, and driver can then rely on GPS to find the best possible solution. It may be the case that the road blockage may cause missing your flight. Therefore, having to go back and re-plan the entire trip.

The same can happen in supply chains. For example, an earthquake or hurricane in a supplier region can cause major delays. However, if this happens often enough then using the learning system that is built-in can make adjustments in how much inventory to keep to avoid similar issues.

Thus, the system becomes adaptive over time as the supply chain dynamics change. If it is infrequent then, the human intervention is needed to come up with more innovative solutions.

Adexa intelligent and distributed agents., i.e. Adexa Genies©, are intended to measure the impact of events and learn from their past experiences.

For example, Supplier Genie decides on potential impact of suppliers on their deliveries, Planning Genie performs analysis of events, both external and internal, in order to decide what level of re-planning, if any, is needed, as described above. Asset Management Genie examines the impact of usage of equipment and frequency of breakdowns and their impact on service level.

Adexa Genies function as intelligent sensors that sense, act and learn to predict. As they grow, their intelligence improves and become more and more predictive preventing unnecessary risks in the supply chain. To this end, the supply chain is constantly and continuously becoming more resilient and smarter.

Let's make **accurate** plans together!

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